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Loss given default adjusted workout processes for leases

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ABSTRACT

Employing defaulted leases, this study divides the loss given default (LGD) into two parts. So far, LGD has been regarded as a holistic measure of risk. However, considering the specifics of leases, we distinguish between asset-related and miscellaneous revenues of the workout process in order to calculate component LGDs. We introduce a multi-step approach to estimate the overall LGD of leases, based on its economic composition. The performance is assessed out-of-sample and out-of-time. We find that our approach generates stable and accurate estimations. Moreover, using the estimated component LGDs, we obtain valuable information regarding the debt collection procedure that lead to monetary advantages for the lessor.

1. Introduction

Credit risk modeling is an essential assignment of risk management in financial institutions. One of the major drivers of credit risk is the loss given default (LGD). The knowledge of potential losses is crucial for an efficient allocation of regulatory and economic capital and also for credit risk pricing. Pursuant to Article 107 (1) of the capital requirement regulation (CRR), financial institutions shall apply either the Standardised Approach or the Internal Ratings Based Approach (IRBA) in order to calculate their regulatory capital requirements for credit risk. When implementing the advanced IRBA, it is mandatory to develop internal models for estimating the probability of default (PD), exposure at default (EAD), and LGD. One of the main objectives of the IRBA is to achieve risk-adjusted capital requirements (see Basel Committee on Banking Supervision, 2003). Accurate forecasts of PD, EAD, and LGD may result in competitive advantages for the applying financial institution in general, as is indicated by Gürtler and Hibbeln (2013).

While the procedure for calculating the PD might be almost identical for loans and leases, models for estimating the LGD should consider specific characteristics of leasing contracts. The analysis of the leasing business is particularly important considering that a high amount of externally financed investments and total investments in European economies are financed by leasing, e. g. 50% and 25%, respectively, in 2015 in Germany. In contrast to loans, the collateralization of a lease by its leased asset is obligatory. In particular, being the legal owner of the leased asset, the lessor can retain any recovered value of the leased asset's disposal. Thus, unlike in the case of loans, the lessor has legal access to this additional source of payments in the event that a contract defaults. Eisfeldt and Rampini (2009) argue that the main benefit of leasing is that repossession of a leased asset is easier than foreclosure on the collateral of a secured loan. During the workout process of a defaulted loan, the lender receives payments exclusively from the debtor and the liquidation of collateral. These incomes also occur during the workout process of leases. Consequently, considering the additional incomes from disposing of the leased asset, the cash flows of the leasing workout process consist of two parts. One part comprises the asset-related cash flows, the other part comprises all remaining cash flows. Han and Jang (2013), Töws (2014), and Frontczak and Rostek (2015) argue that the level of LGD crucially depends on the actions taken during the workout process. Hence,

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the specific features of the workout process of leases should be taken into account when estimating LGD.

In the recent literature various advanced approaches for estimating the LGD have been analyzed. Bastos (2010), Hartmann-Wendels et al. (2014), and Yao et al. (2015) find that complex models are able to generate robust and precise LGD predictions in principle. Nevertheless, either for loans or leases, no single estimation approach has been established yet. Remarkably, the majority of the estimation approaches introduced so far has in common that the LGD is regarded as a holistic measure of risk. With regard to the LGD of loans, such an approach is reasonable. However, according to the specific characteristics of leasing contracts, the LGD of leases typically consists of cash flows from two distinct sources. Thus, a holistic approach to estimate the LGD of leases might be inappropriate.

Therefore, we present a new approach to forecasting leasing LGDs. In our study, we consider the specific characteristics of leases and, consequently, we suggest an economically motivated separation of the LGD into an asset-related part and a miscellaneous part. Coming from different payment sources, both parts should be driven by different factors. The required information about the breakdown of the cash flows is compulsory for institutes using the IRBA according to Article 181 CRR. These institutes cover more than 20% of German leasing investments. In addition, due to rising requirements for internal risk models, the number of non-IRBA institutes with comprehensive information of the relevant cash flows will increase in the near future (see, e. g., European Banking Authority, 2014 and European Banking Authority, 2015).

While our approach is explicitly designed to estimate leasing LGDs, the basic idea can be adjusted in general to estimate the LGD of other instruments such as collateralized loans and in particular mortgages. The only requirement is that the considered instruments include cash flows obtained during the workout process from distinct payment sources.

In the course of this paper, we describe the development of a multi-step estimation model, which is built upon the economic composition of the LGD of leasing contracts. Estimating the asset-related and miscellaneous parts, we derive an estimation of the overall LGD. Our easily traceable model results in a significant advantage in terms of estimation accuracy.

Moreover, the estimated asset-related and miscellaneous LGD can be used to support decisions concerning the accomplishment of the workout process. In fact, the separation of LGD has extensive practical implications for handling a defaulted contract's workout process. The derived shares of LGD are indicators for the success of both the asset's disposal and the effort of collecting further payments. Consequently, we find that our inferred suggestions for the actions to be taken by the lessor during the workout process lead to significant improvements in the resulting LGD value of the respective contracts and thereby generate monetary advantages.

For our study, we use a real-life dataset provided by a major German lessor. The data is of high quality with regard to details, which is particularly important in our approach. We compare the performance of our procedure to that of traditional holistic methods for LGD estimation carried out, for example, by ordinary least squares (OLS) regression. In particular, to measure the accuracy and robustness of the models, we use in-sample, out-of-sample, and out-of-time validation. Moreover, considering the economic context and the obtained estimation errors, we discuss theoretical and practical advantages or disadvantages of each step in our approach.

2. Related literature

The linear regression has so far been the most frequently used method for estimating the LGD in the existing literature on LGD research. Nevertheless, when regarding the specific features of the LGD distribution, linear regression seems to be at least econometrically inappropriate for the estimation task. Typically, the workout LGD of loans and leases, calculated from discounted cash flows after the default of the customer is bimodally or even multimodally distributed (compare Laurent and Schmit, 2005, Zhang and Thomas, 2012, Hartmann-Wendels et al., 2014, and Li et al., 2014). This unusual shape of the density suggests that LGD estimation requires the use of advanced methods. These methods should be able to approximate the complex relationships between the available information and the LGD as precisely as possible in order to produce accurate and comprehensible estimations.

Against this theoretical and practical background, a number of different methods have already been investigated in the literature. In particular, the relevant studies examine the models' suitability and predictive accuracy for LGD estimation.

Several studies focus on reproducing the LGD's density function in order to extrapolate accurate estimations in this manner. For this purpose, Calabrese and Zenga (2010) use a mixed random variable to model LGD on the unit interval. They apply their concept to a large set of defaulted Italian loans. Altman and Kalotay (2014) adopt a similar approach based on the mixture of Gaussian distributions. They report successful estimations using Moody's Ultimate Recovery Database (MURD). Hartmann-Wendels et al. (2014) also apply an approach based on finite mixture models in order to estimate the LGD of leases. However, out-of-sample, their approach performs poorly. The authors conclude that reproducing the LGD density is only of secondary importance to the estimation accuracy.

Further studies examine the suitability of various parametric and nonparametric methods for LGD estimation. Applying several regression techniques to the data of six different banks, Loterman et al. (2012) conclude that nonlinear methods perform better than linear methods. Qi and Zhao (2011) obtain a similar result. They compare different parametric and nonparametric methods using MURD. The authors argue that nonparametric methods can generate more accurate LGD estimations due to their ability to model nonlinear relationships between the LGD and continuous explanatory variables. In particular, they find regression trees to be a suitable nonparametric method for estimating LGD. Bastos (2010) obtains a similar outcome when he uses regression trees on Portuguese bank loans. Likewise, Hartmann-Wendels et al. (2014) successfully apply model trees to estimate the LGD of German leases.

Recently, some studies have applied ensemble learning techniques to estimate LGD. These are an extension of the analysis of single procedures. Bastos (2013) improves the estimation accuracy significantly by using regression trees in an ensemble approach on MURD. On a set of leases, Töws (2014) finds that random forests achieve higher coefficients of determination than does linear regression.

In addition to single-stage models, some studies implement two-stage models to forecast LGD. Typically, these models split the observations ex-ante according to a specific key feature. To predict the LGD of mortgage loans, Leow and Mues (2012) first estimate the probability of mortgage accounts undergoing repossession. Then, they calculate the loss in the event of repossession using a certain haircut value. The latter is the ratio of the forced sale price and the valuation of the repossessed property. Concerning the LGD of leases, Töws (2014) successfully introduces a two-stage approach. He distinguishes between recovered and written-off contracts and then estimates the respective LGD.

Although the findings of several studies show that complex models can generate more accurate LGD estimations than standard econometric techniques such as the linear regression, the results of Qi and Zhao (2011) and Hartmann-Wendels et al. (2014) indicate that overfitting is a common concern of complex

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